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Resolving hiatus in (isi)Ndebele: An optimality theoretic account

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ABSTRACT

Vowel hiatus is a dispreferred phenomenon in many languages. When vowel sequences arise through morphophonological concatenations in (isi)Ndebele, hiatus may be resolved in one of three processes: (i) one of the two vowels undergoes elision; (ii) one of the vowels (mostly the first vowel in the sequence) undergoes glide formation; and (iii) the two vowels undergo vowel coalescence – the merging of the two vowels into a neutral vowel that has the qualities of both the two initial vowels straddling a word boundary. This article examines these vowel hiatus resolution strategies in (isi)Ndebele, through the theoretical explications of Optimality Theory (OT) and CV Phonology. In (isi)Ndebele, the featural qualities of the two vowels straddling a word boundary and the morphological contexts at which the hiatal configurations occur determine what process repairs vowel hiatus. Hiatus resolution is also invariably ONSET and feature driven: driven by Preferred Syllable Structure Rules(PSSRs) and constraints.

1. Introduction – a brief history of (isi)Ndebele

The term 'Ndebele' has come to be used to refer to both the language and the people who speak it. Ndebele (also often referred to as isiNdebele) is a Southern Bantu language belonging to the Nguni cluster (Zone S40 in Guthrie's (1948) classification of Bantu languages). The cluster includes other languages such as Zulu, Xhosa, Transvaal Ndebele (often referred to as South African Ndebele) all spoken in South Africa, as well as Swazi/SiSwati, spoken in Swaziland and South Africa (Hadebe, 2002, 2006). In this study however, the term '(isi)Ndebele' is used to refer to the Zimbabwean variety of the language and the South African variety, if made reference to, shall be referred to as South African Ndebele. In Zimbabwe, the Ndebele language is largely spoken in the western as well as southern parts of the country. Hadebe (2002, 2006) and Cope (1993) postulate that the history of the language and its people dates back to the period around 1820 when the people who are currently referred to as the 'Zimbabwean Ndebele' broke away from the then powerful Zulu kingdom (presently the KwaZulu-Natal province of South Africa).

Hadebe (2006) posits that the initial breakaway group was provisionally referred to as the Khumalos because their then leader, Mzilikazi, was a descendent of the Khumalo clan. Around 1837, the breakaway group allegedly entered what is currently Zimbabwe and settled in the western and southern parts of the country known in contemporary Zimbabwe as the Matebelel and Province. Viewed as just a dialect of Zulu, (isi)Ndebele for a long time was largely neglected in the areas of research in favour of Zulu. This however, does not come as a surprise especially considering that the present day Ndebele speaking people of Zimbabwe and the Zulu speaking people of South Africa share a lot, that is, almost the same languages (since their languages are mutually intelligible), some common historical experiences and various cultural practices and beliefs (Cope, 1993: Hadebe, 2006). Interesting to note however, is that despite the Ndebele people and the Ndebele language having evolved independently of the other Nguni dialects, research has indicated that most people of Ndebele descent still identify themselves with Zulu history, culture and language.

2. (Isi)Ndebele vowel and syllable structure

(Isi)Ndebele, like many other Bantu languages is a five vowel phoneme system. There are no underlying long vowels in the language and neither are there long vowels that occur as a result of

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phonological processes such as elision and coalescence and/or other phonetic processes. Unlike in most Bantu languages, in (isi) Ndebele, there is no compensatory lengthening of vowels in either the Underlying Representations (URs) and/or the Phonetic Representations (PRs) resulting from attempts to preserve V-slots after phonological processes of deletion or merger (coalescence) of juxtaposed vowels. There are also no diphthongs in (isi)Ndebele. The low vowel [*a*] in (isi)Ndebele seems to match the cardinal vowel, the low central/a/. The qualities of the vowels [*e*] and [*o*] in (isi)Ndebele appear to match cardinal vowels 3 and 6 ([ɛ] and [ɔ]) respectively, fairly closely, rather than numbers 2 and 7 ([e] and [o]) respectively, in most environments. The mid front vowel [e] and the mid back vowel [o] are thus also articulated lower than their cardinal vowel equivalents, vowels 2 and 7 and articulated lower than those of other Bantu languages. The distinctive features of these vowels are represented in Table 1 below. The features diagram also supplies redundant values.

The basic syllable structure in (isi)Ndebele is the canonical CV structure. It however can be argued that the basic structure could also be the V(CV) structure in light of the fact that most nouns in the language begin in a vowel since the language utilises the IV (Initial Vowel) or pre-prefix as part of both is phonetic and orthographic inventories. This IV is the one whose existence we can argue to be diachronically responsible for triggering coalescence.

(1) *V(CV) structure*

a) a.kha ‘build’
b) e.nza ‘do’
c) i.nja ‘dog’
d) o.ma ‘get dry/get thirsty’
e) u.ba.ba ‘father’

(2) *CV structure*

a) ma.ma ‘mother’
b) we.na ‘you’
c) mi.na ‘me’
d) lo.khu ‘this’
e) dhlu.la ‘to pass by’

3. Glide formation as hiatus resolution strategy in (isi) Ndebele

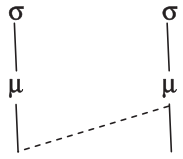
Glide formation is a major hiatus resolution strategy in (isi) Ndebele. The most commonest example of contexts in which such a process occurs is when the high vowel [u] of the infinitive prefix/uku-/‘to’ in Ndebele juxtaposed with vowel commencing verbal forms undergoes glide formation. In these contexts however, the high vowel [u] undergoes glide formation when juxtaposed with all other vowels save the mid – back vowel [o], in which case elision takes place (See example 9). Glide formation in (isi)Ndebele does not result in a compensatorily lengthened resultant vowel. The glide formation in (isi)Ndebele is morphophonemic change – a process which is in line with the [u→w/-back vowel] rule.

The rule that governs gliding in (isi)Ndebele as is the case with most Bantu languages is that a [+high, –low] vowel loses a mora (or glides) before another vowel. The second vowel in the sequence can be low, mid or high (but not back). Such a process is schematized as in (3) below:

Table 1
(Isi)Ndebele vowel features.

	i	e	a	o	u
Back	–	–	–	+	+
High	+	–	–	–	+
Low	–	–	+	–	–
Round	–	–	–	+	+

(3) *Gliding of high vowels in Ndebele*



= [-cons, -low] [-cons]

I argue here that this process is triggered by language internal phonological and/or morphophonological constraints that disprefer the surfacing of vowel sequences in the PRs of the language. Let us consider the following examples in (5). In the examples we can note that in (isi)Ndebele glide formation does not result in long surface vowels. This is in ‘disregard’ for place maintenance (in this regard vowel places) and thus in violation of the constraints MAX-V and MAX-IO.

(4) MAX-V: All vowel segments in the input should have corresponding segments in the output. (Mkochi, 2007; Sabao, 2013)
MAX-IO: All segments in the input should have corresponding segments in the output (Rosenthall, 1997).

(5)

a) uk***u***- ***a***zi [ukwazi] /u_1#a_2/→ [w_1a_2] ‘to know’
inf- know

b) uk***u***- ***a***kha [ukwakha] /u_1#a_2/→ [w_1a_2] ‘to build’
inf- build

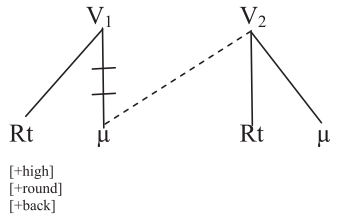
c) uk***u***- ***a***la [ukwala] /u_1#a_2/→ [w_1a_2] ‘to refuse’
inf- refuse

d) uk***u***- ***e***sula [ukwesula] /u_1#u_2/→ [w_1e_2] ‘to wipe/rub’
inf- wipe/rub

e) uk***u***- ***e***nza [ukwenza] /u_1#e_2/→ [w_1e_2] ‘to do’
inf- do

This kind of glide formation in which the high vowel [u] turns into a glide [w] in the face of all the other vowels except the mid back vowel [o] can also be schematized as in (6) below:

(6)



Glide formation: /u/→/w/ in (isi)Ndebele.

to the initial vowel as it retains its [+high], [+back] and [+round] features. Glide formation here is elected above other possible resolution strategies because it maximizes featural as well as articulatory identity while in the process also successfully eliminating the disprefered configuration. Let us, in this regard, examine Tableau 2.

(8) PARSE[F']: Preserve an input feature[F] in the output (Casali, 1996, 1997; Tanner, 2007).
IDENT[±high]: Input and output should be identical for the features [+high] and/or [−high] (Sabao, 2009).
IDENT(μ): Every mora in the input has a correspondent in the output (McCarthy, 1995)

uk**u-e.**nza/	ONSET	PARSE[F']	IDENT [±high]	IDENT(μ)	UNIFORMITY
(a) /u.ku.e.nza/	*!				
(b)☞/u.kwe.nza/		*		*	**
(c) /u.ke.nza/		*	*!	*	**
(d) /u.ku.nza/		*	*!	*	**

Tableau 2: Gliding of the high vowel [u] in (isi)Ndebele, with no compensatory lengthening

Glide formation happens here through a process in which the V_1 (which has the features [+high] and [+round] and [+back]) undergoes delinking with its associated mora. Through this process, which is mora preserving, it attaches it to V_2. V_1 however maintains its attachment to the root node thus preserving articulatory features.

We note that, like in many other languages glide formation in (is)Ndebele, if argued to be ONSET driven is also invariably in violation of the constraints *CG as well as IDENT-IO as illustrated in Tableau 1 below:

(7) ONSET: *[$_{\alpha}$V: Syllables must have onsets (Itô, 1989; Prince and Smolensky, 1993)
*Complex: Avoid complex [Cw] and [Cy] onsets (Prince and Smolensky, 1993)

Here we note that candidate (a) is in fatal violation of ONSET due to heterosyllabification and thus is eliminated. Candidates (c) and (d), which could be showing either coalescence (symmetric fusion) or elision, are in fatal violation of the feature preservation constraint(s) IDENT [±high]. They are invariably in violation of the constraints PARSE[+high] and PARSE[-high] respectively, constraints which are subsumed in the constraint IDENT [±high] – (PARSE[+high]: Preserve an input feature [+high] of either the root or affix in the output and PARSE[-high]: Preserve an input feature [−high] of either the root or affix in the output.) This is so because (c) fails to preserves the [+high] feature of the [+high, −low] input prefix vowel/u/while (d) fails to preserve the feature [−high] of the [−high, −low] of the V_2 vowel/e/. Both however manage to preserve the [−low] feature, a feature shared by both of the initial vowels. They however both get eliminated because they fail to

/uku-enz-a/	ONSET	*Complex	IDENT-IO
(a) ☞/ukwe.nza/		*	*
(b) /uku.e.nza/	*!		

Tableau 1: Gliding of the high vowel [u] in (isi)Ndebele, with no compensatory lengthening

We can argue that what really conditions and motivates glide formation here is the need to preserve segmental identity as well as featural identity between the input and the output. This is evidenced by the fact that the resultant glide is featurally identical

preserve the [+back] and [−back] features of the input vowels respectively.

Candidate (b) despite violations of both PARSE[F'] due to the loss of the [+syllabic] feature of the input vowel [u] and IDENT(μ), due

to the changes in mora count manages to maximize height featural and articulatory identity. As explained earlier in the paper, it is important to note that if the same infinitive prefix vowel [u] is juxtaposed with a mid-back vowel/o/commencing verbal form, elision of the V_1 (the prefix final vowel) instead of glide formation/ insertion invariably occurs. Consider the following examples in (9) in which the V_1 elision occurs instead of glide formation.

(9)

a) uk***u***- ***o***ma [ukoma] /u_1#o_2/→ [o_2] 'to dry/get thirsty'
inf- dry/thirst

b) uk***u***- ***o***na [ukona] /u_1#o_2/→ [o_2] 'to make mistakes/sins'
inf- make mistake

Despite the conditions for glide formation being satisfied by examples in (9), elision takes place. We therefore can thus argue for V_1 elision, precisely for these examples, as opposed to glide formation in instances in which the V_2 in the sequence is the mid back vowel [o]. Whereas glide formation occurs when the V_2 is the mid vowel [e], a vowel which shares the same [−high, +low] quality with the vowel [o] (See examples 5(c) and 5(d)) the presence of the [+back] feature of the vowel [o] triggers V_1 elision and not glide formation. We can also argue that this is not coalescence because typically, (isi)Ndebele as is the case with many Bantu languages does not exhibit evidence of instances of symmetric coalescence. Coalescence in (isi)Ndebele is largely asymmetric. Instances of vowel coalescence in (isi)Ndebele are largely asymmetric and are thus triggered by specific serial orderings of the vowels straddling a word boundary and are in line with the Dokean thesis on coalescence in Bantu languages expressed in example (15). Arguing for coalescence instead of elision thus would imply arguing for rare cases of symmetric coalescence in the language. This could be problematic because in all other contexts and instances in which coalescence occurs it is asymmetric.

4. Consonantal epenthesis as hiatus resolution strategy in (isi)Ndebele

Glide/consonantal epenthesis in (isi)Ndebele is another major vocalic hiatus resolution strategy. This process also occurs at the same preposition − noun boundary that vowel coalescence occurs as is discussed and exemplified in (11a) below. The reason why coalescence doesn't take place in the contexts discussed here in (10) as it does in (11a) is because of the presence of the plural marker vowel/o/. Coalescence at such a boundary in (isi)Ndebele only takes place if the noun that provides V_2 commences in the initial vowels/i/,/u/and/a/(c.f. examples 10, 16, 17 and 18). If the nouns begin with the mid-back vowel/o/, which occurs as either a plural marker or an agreement morpheme, consonantal epenthesis and not coalescence takes place. Consider the following examples in (10) regarding that;

(10)

a) l***a***- ***o***- mama [la***b***omama] /a_1#o_2/→ [a_1***b***$_e$$o_2$] 'with mothers'
Prep 'with/by/and'- pl- mother

b) l***a***- ***o***- mangoye [la***b***omangoye] /a_1#o_2/→ [a_1***b***$_e$$o_2$] 'with cats'
Prep 'with/by/and'- pl- cat

Epenthesis in the above contexts is triggered by the presence of the mid back vowel/o/juxtaposed with the low vowel/a/of the prepositional prefix. We also can argue that this happens because the V_2 is not only a single segment morpheme but also a plural marker. This is so in light of the realisation that when those same words occur in the singular forms, coalescence and not epenthesis occurs. Compare (11a) and (11b) below:

(11a) *Coalescence with singular forms*

i) la- u-mangoye [a_1#u_2]→[o_3] /lomangoye/ 'with/and/by a cat'
Prep 'with/and/by'-1s-cat

ii) la- u-mama [a_1#u_2]→[o_3] /lomama/ 'with/and/by a mother'
Prep 'with/and/by'-1s-mother

(11b) *Epenthesis with plural forms*

i) la- o-mangoye $[a_1\#o_2]\rightarrow[a_1bo_2]$ /labomangoye/ 'with/and/by cats'

Prep 'with/and/by'-pl-cats

ii) la- o-mama $[a_1\#o_2]\rightarrow[a_1bo_2]$ /labomama/ 'with/and/by mothers'

Prep 'with/and/by'-pl-mother

We can account for this kind of segmental epenthesis exemplified in (11b) (a process which results in the violation of IDENT-IO and DEP-IO since the output contains a segment not in the input) by using the schema in (13) below.

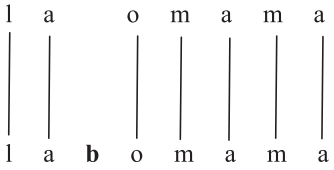
ranking of the constraint ONSET over DEP-IO. This kind of ranking is illustrated by Tableau 3 below, containing only the two constraints ONSET and DEP-IO which prefers and disprefers the presence versus the absence of the epenthetic consonant respectively.

/l**a-o**-mama/	ONSET	DEP-IO
(a) ☞/la.**b**o.ma.ma/		*
(b) /la.o.ma.ma/	*!	

Tableau 3: ONSET driven consonantal epenthesis in (isi)Ndebele

(12) DEP-IO: Every segment in the output has a corresponding segment in the input (McCarthy and Prince, 1995).

(13)



Epenthesis in this regard can be argued to have been primarily motivated by the desire to eliminate onsetless syllables. I note here that, because (isi)Ndebele is an Initial Vowel (IV) using language, the IV always surfaces as an onsetless syllable and that the constraint ONSET only thus applies exclusively to word medial/internal syllables. Onsetless syllables are only allowed word initially, but input hiatus cannot surface in the output.

This in itself is a problem for an ONSET analysis, since only in word medial positions is the ONSET violation repaired. This is also reflected in Tableau 4 below:

/l**a-o**.ma.ma/	ONSET	DEP-IO	PARSE[F']	PARSE[F]-1seg	IDENT-IO	UNIFORMITY
(a) /la-o.ma.ma/	*!					
(b)☞/la-bo.ma.ma/		*			*	**
(c) /lo.ma.ma/			*!		*	**
(d) /la.ma.ma/			*!	*(!)	*	**

Tableau 4: Consonantal epenthesis in (isi)Ndebele

Epenthesis, any form of epenthesis, involves the violation of faithfulness constraints. This is so because the epenthetic segment-containing output diverges from the input by the presence of an epenthetic segment, one that 'is not sponsored by the lexical representation' (Archaengeli and Langendoen, 1997). As a hiatus resolution mechanism, epenthesis here is triggered by the higher

(14) PARSE[F']-1seg: Preserve all the features of single segment morphemes/words (Tanner, 2007; Sabao, 2009, 2013)

We observe here that candidate (a) is eliminated because it violates ONSET (preserves the vowel sequence), candidate (c) also

deletes a segment and thus violates PARSE[F'] because it deletes the [−high −low] features of the input vowel [o] and thus gets eliminated. Candidate (d) not only deletes a segment but also deletes a single segment (the plural marker morpheme/o/). The problem is that such kind of deletion renders it impossible to distinguish this form from the singular form (c.f. (10a) above). The two candidates, (c) and (d) thus also violate PARSE[F'] (because (c) fails to preserve the [+low] feature of the input vowel/a/while candidate (d) fails to parse the [−low] feature of the input vowel/o/). Candidate (d) also violates PARSE[F]-1seg and DEP-IO and therefore gets eliminated. The two candidates (c) and (d), while eliminating the dispreferred hiatal configuration get eliminated largely because of a violation of PARSE[F'].

The kind of consonantal epenthesis occurring in (isi) Ndebele is evidence of the key observation that epenthesis and syllabification are inextricably connected (Selrkik, 1981: Ito, 1986, 1989; Archaengeli and Langendoen, 1997). Epenthesis is largely motivated towards the elimination of onsetless syllables. Accordingly, an epenthetic segment thus is an empty structural position whose presence is required to eliminate disprefered hiatal configurations. This syllabic make-up/blueprint dictates whether or not an onset is obligatory/necessary as exemplified by the examples in (10a) and (10b) above in which we can argue that the language's syllabic blueprint dictates the repair of ONSET in word medial syllables.

Kager (1999) proposes that such kind of epenthesis exemplified by the consonant/b/insertion as discussed above is necessitated by 'an imperfect match between the input segments and the template'. The mismatch here arises from the realization of a vowel sequence in the UR which does not have an intervening consonant whereas the syllable blueprint obligates an onset. Bearing in mind that the ongoing discussion arose from a discussion of glide formation in the language, we would also consider, that since on similar morphophonological boundaries, when the other vowels (save for the mid-back/o/) occur after the infinitive prefix/uku-/glide formation occurs, the fact that in the same environments the occurrence of/o/triggers epenthesis is an indication of a higher preference for epenthesis over glide formation. This translates to evidence of a higher ranking of ONSET above DEP-IO. This ranking is illustrated Tableau 5 below.

/uk**u-o**n-a/	ONSET	DEP-IO
(a) ☞/u.ku.bo.na/		*
(b) /u.ku.o.na/	*!	

Tableau 5: Ranking of ONSET over DEP-IO in hiatal contexts in (isi)Ndebele

An interesting notion to observe is that, despite the fact that the conditions in which consonantal epenthesis takes place are similar to those that condition glide formation, in the current scenario, consonantal epenthesis occurs instead. Gliding of the V_1 [u] also does not also violate ONSET. The reason for the choice of consonantal insertion over glide formation in this context could be that in the environment under discussion, the occurrence of the mid-back vowel/o/must have triggered a constraint that elects epenthesis over glide formation. This however warrants further research.

In the same vein we also consider example (11a) in which deletion and not glide formation occurs as is ordinarily supposed to. While I am still not sure why in the environment (11a) deletes (which in my own observation seems to be an exceptional case), I would again propose that in (11a) deletion is triggered by the same desire to eliminate onsetless syllables. In many languages, elision is largely ONSET driven (c.f. Pulleyblank and Ola Orie, 1998). A failure to delete in this regard violates ONSET. The resolution of the vowel sequence through elision however violates MAX-IO.

5. Coalescence as hiatus resolution strategy in (isi)Ndebele

Vowel coalescence is one of the major hiatus resolution strategies in (isi)Ndebele. Coalescence in many languages takes any or all of the three basic form which are; (i) the two vowels which are different merging into an intermediate quality vowel (a third vowel that shares the characteristics of both the original vowels) or (ii) the merging of identical short vowels into a long vowel, or else (iii) the two vowels are replaced by a single instance of them, either short or long (Sabao, 2012, 2013). As with many other Bantu languages, at the functional word-lexical word boundary involving prepositions and nouns, (isi)Ndebele resolves vowel sequences through coalescence. This occurs within the Dokean parameters enunciated in (15) below.

(15) *Vowel hiatus resolution through coalescence in Bantu languages* (Doke, 1943)

a) /a + a /→ [a]

b) /a + i /→ [e]

c) a + u /→ [o]

The most interesting thing to note is that coalescence in (isi) Ndebele, as is the case with other resolution strategies, does not occur with compensatory lengthening. Let us consider the following examples in (16) adapted from Sabao (2012) in which coalescence occurs at a functional word-lexical word boundary.

(16)

a) l***a***- ***u***mu- nthu [lomunthu] /a_1#u_2/→ [o_3] ‘with/by/and a person’
Prep ‘with/by/and’- 1s-person

b) l***a***- ***u***m- ntwana [lomntwana] /a_1#u_2/→ [o_3] ‘with/by/and a child’
Prep ‘with/by/and’-1s-child

c) l***a***- ***u***m- fana [lomfana] /a_1#u_2/→ [o_3] ‘with/by/and a young person’
Prep ‘with/by/and’-1s-young man/person

d) l***a***- ***a***ba- ntu [laba ntu] /a_1#a_2/→ [a_3] ‘with/by/and a people’
Prep ‘with/by/and’-2s /CL2/2SM/pl -people

e) l***a***- ***a***ba- fazi [labafazi] /a_1#a_2/→ [a_3] ‘with/by/and women’
Prep ‘with/by/and’-2s /CL2/2SM/pl -woman

f) l***a***- ***a***ma- siko [lamasiko] /a_1#a_2/→ [a_3] ‘with/by/and nations’
Prep ‘with/by/and’-6s (pl)-nation

g) l***a***- ***i***- ndlu [lendlu] /a_1#i_2/→ [e_3] ‘with/by/and a house’
Prep ‘with/by/and’-5s-house

h) l***a***- ***i***- nkomo [lenkomo] /a_1#i_2/→ [e_3] ‘with/by/and cattle’
Prep ‘with/by/and’-9s-cattle

i) l***a***- ***i***- nja [lenja] /a_1#i_2/→ [e_3] ‘with/by/and a dog(s)’
Prep ‘with/by/and’-9s-dog

In the same manner that we have coalescence taking place at morphological boundaries involving the preposition/la-/and a vowel commencing noun/verbal form, the same process also occurs when a hiatal configuration occurs involving the instrumental prefix/nga-/and a vowel commencing noun. In such circumstances, the Dokean thesis prescribed outcomes discussed in (15) as well as the merger rules described in (19) and (20) and (21) below also apply. Consider the following examples in (17) below.

Again the same kind of coalescence also occurs at the boundary between the possessive concord/wa-/‘of’ and a vowel commencing noun. The possessive concord in (is)Ndebele is formulated by merging together the particle/-a-/with the subject concord of the noun in question. The process of coalescence here again yields the same vowel patterns as those hypothesized by Doke (1943) and discussed above in (15). For evidence of this consider the following examples in (18).

(17)

a) ng***a***- ***u***mlomo [ngomlomo] /a_1#u_2/→ [o_3] ‘with the mouth’
Prep ‘with’- mouth

b) ng***a***- ***a***manzi [ngamanzi] /a_1#a_2/→ [a_3] ‘with water’
Prep ‘with’- water

c) ng***a***- ***i***litshe [ngelitshe] /a_1#i_2/→ [e_3] ‘with a stone’
Prep ‘with’- stone

(18)

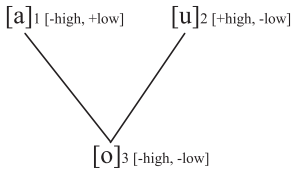
a) w***a***- ***u***m-fana [womfana] /a_1#u_2/→ [o_3] 'the young man's'
Poss-1s-young man

b) w***a***- ***a***ba-fazi [wabafazi] /a_1#a_2/→ [a_3] 'the women's'
Poss-3s –women

c) w***a***- ***i***nkazana [wenkazana] /a_1#i_2/→ [e_3] 'for the girl/the girl's'
Poss- girl

The process that occurs in examples (16a–c), (17a) and (18a) can be schematised as follows:

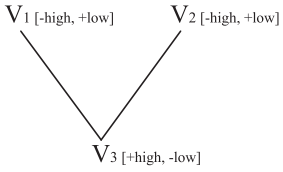
(19)



Fusion of low vowel /a/ and high /u/ into mid vowel /o/ in (isi)Ndebele

We can, in line with such a thesis, summate the asymmetric coalescence that takes place in (16d–f), (17b) and (18b) as follows:

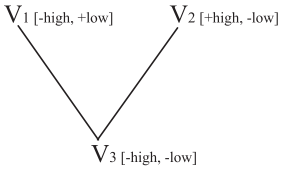
(20)



(Fusion of identical vowels /a+a/→/a/ in Ndebele)

Whereas that which occurs in the remainder of all the other examples in (16g–i), (17c) and (18c) as follows:

(21)



(Fusion of dissimilar vowels /a+u/→/o/ and /a+i/→/e/ in Ndebele)

Coalescence in Ndebele does not result in compensatorily lengthened surface vowels. As a repair strategy coalescence invariably violates a constraint MAX-IO (Maximum Input–Output), which demands the preservation of all input vowel segments in the output. The constraint NLV (No Long Vowels) whose violation lengthens the surface vowel in a bid to maintain V-slots and in the process preserve segmental identity is thus also ranked high in the language (NLV: Avoid long vowels – Rosenthall, 1997). In fact it must be ranked higher than MAX-V (All vowel segments in the input should have corresponding segments in the output) which aims at segmental identity as we observe that the output vowels are not compensatorily lengthened. Consider the following tableaus in this regard:

/l**a-i**.nja/	ONSET	NLV	MAX-V	MAX-IO
(a) ☞/le.nja/			*	
(b) /le:.nja/		*!		*

Tableau 6: Asymmetric coalescence with no compensatory lengthening in (isi)Ndebele

(22) NLV: Avoid long vowels (Rosenthall, 1997)
MAX-V: All vowel segments in the input should have corresponding segments in the output. (Mkochi, 2007, Sabao, 2013)
MAX-IO: All segments in the input should have corresponding segments in the output (Rosenthall, 1997).

Despite the fact that both candidates eliminate the hiatal configuration, and thus do not violate ONSET, candidate (b) gets eliminated because of its failure to preserve segmental identity and place through a violation of NLV.

Coalescence in Ndebele (which is also height coalescence) can be described as being asymmetric, that is to say, sequences of/V_1 + V_2/resolve differently depending on the feature specification of the two vowels: sequences of low + low vowels merge into a similar low vowel (as in examples (16d–f), (17b) and(18b)), low + high vowel sequences result in a mid vowel (as in examples (16a–c), (16g–i), (17a), (17c), (18a) and (18c)). The resultant vowel, it should be noted agrees in rounding and/or backness with the second vowel of the sequence.

Asymmetric coalescence can be distinguished from another form of coalescence called symmetric coalescence in that in the latter the resultant vowel from the vowel merger does not rely on the serial ordering of the vowels in the sequence whereas in the former it does. In symmetric coalescence, the same vowel combinations will yield similar resultant vowel, for example, according to Tanner (2007), in the language Afar sequences of/u+e/and/e+u/ would yield the coalesced vowel [o] irrespective of their differences in ordering.

Regards this, we observe that a change/reversal in the serial ordering of the vowels straddling a word boundary triggers the ordering of other vowel hiatus repair strategies before coalescence. For instance, while we note that the vowel sequence of the low [a] and the high back [u] would trigger coalescence, with the coalesced vowel being the mid [o], if the sequence is reversed i.e. the high back [u] occurring in V_1 position before a low [a], the high vowel undergoes gliding as in the following examples:

(23)

a) uku- azi /ukwazi/ ‘to know’
inf- know

b) uku- akha /ukwakha/ ‘to build’
inf- build

The resolution of vowel sequences through coalescence reflected in the above examples in (16), (17) and (18) and schematized as in (19), (20) and (21) above result from a higher ranking of ONSET as well as a subsequent violation of the lower ranked IDENT-IO, MAX-IO and UNIFORMITY as exemplified below from example (16i).

/la-i.nja/	ONSET	IDENT-IO	UNIFORMITY
(a) ☞/le.nja/		*	*
(b) /la.i.nja/	*!		

Tableau 7: ONSET driven coalescence with dissimilar vowels in (isi)Ndebele

The ranking here is thus ONSET»IDENT-IO. We also note that unlike in other Bantu languages in which hiatus resolution results in lengthening of the resultant vowel in a bid to preserve place (V-slots), in Ndebele the coalescence vowel is typically short. This is because, as earlier highlighted, there are no underlying and/or long vowels in the language. The non-occurrence of such long vowels in resolved contexts thus, as indicated in Tableau 6, is in violation of IDENT-IO and UNIFORMITY and fails to maximize segmental identity between input and output as well as articulatory features.

We also note in this regard that coalescence in the language is height sensitive, position sensitive and place sensitive. It is some form of segmental fusion in which two segments in the input correspond to a single segment in the output. Coalescence thus in line with this thesis yields resultant vowels whose features are dictated by a higher ranking of IDENT(-F) over IDENT(+F) in which equation (F) represents the vowel articulatory features [high] and [low]. I note, for example, from the example in Tableau 6 that despite the V_2 having the feature [+high], the resultant coalesced mid vowel [e] has articulatory feature [−high] also a feature of the V_1 as indicated in (19) above.

The same process exemplified in Tableau 6 (drawn from examples in 16) is also evident in examples (17) and (18) as represented by Tableau 8 below (which draws from the data in 17a). This process, at the surface level is also motivated by the need to eliminate disprefered vowel clusters, in the process incurring the violations represented below;

/ng**a**-**u**mlomo/	ONSET	IDENT-IO	UNIFORMITY
(a) ☞/ngo.m.lo.mo/		*	*
(b) /nga.u.m.lo.mo/	*!		

Tableau 8: Fusion of low vowel /a/ and high /u/ into mid vowel /o/ in (isi)Ndebele

This kind of coalescence argued for here can be argued to be conditioned by the ranking of PARSE[−high] over PARSE[+high] (See tableau 9). In this regard, there is a constraint ranking hierarchy that would violate constraints aimed at preserving all segments of the lexical word, especially the [+high] feature and/or other features of the lexical word initial vowel in a bid to preserve the feature [−high] and or other features of the prefix (functional word) final word vowel. The constraints used in determining the surface form from the inputs are PARSE[−high], PARSE[+high]-lex, PARSE[F']-lex and PARSE[F'].

Such being the case, we argue that the output forms here are as a result of the ranking of PARSE[−high] »PARSE[+high] as illustrated below;

/l**a-i.**nja/	ONSET	PARSE[-high]	PARSE[+high]	PARSE[F']-lex	PARSE[F']
(a) /li.nja/		*!			*
(b) /la.nja/			*	*!	*
(c) ☞/le.nja/			*		*
(d) /la.i.nja/	*!				

Tableau 9: Fusion of dissimilar vowels in (isi)Ndebele

/w**a-u**mfazi/	ONSET	PARSE[-high]	PARSE[+high]-lex	PARSE[F']-lex	PARSE[F']
(a) /wu.m.fa.zi/		*!			*
(b) /wa.m.fa.zi/			*	*!	*
(c)☞/wo.m.fa.zi/			*		*
(d) /wa.u.m.fa.zi/	*!				

Tableau 10: Coalescence of low vowel /a/ and high /u/ into mid vowel /o/in (isi)Ndebele

here, as is with most of the examples in (16), (17) and (18) above, that the features of the coalesced vowels result from a ranking of the PARSE[−F] »PARSE[+F] as well as that of IDENT[−F]» DENT [+F].

In the above examples of coalescence in Ndebele i.e. examples (16), (17) and (18), we again observe that the sequences of low + high vowels that occur at word-internal morpheme boundaries are realized as mid vowels, with the backness and rounding of the resulting vowel corresponding to the rounding of the second vowel in the sequence. This second vowel is again the IV or the lexical word initial vowel.

(24) PARSE[−high]: Preserve an input feature [-high] of either the root or affix in the output. (Tanner, 2007; Sabao, 2013)
PARSE[+high]-lex: A feature [+high] present in the input lexical (root) morpheme must be parsed in the output (Tanner, 2007; Sabao, 2009, Sabao, 2012).
PARSE[F']-lex: Other features of the root morpheme vowel must be parsed in the output (Tanner, 2007; Sabao, 2013)

In line with the argument that we have established so far, i.e. that deletion (and at times other asymmetric repair strategies) is conditioned by a higher ranking of feature [−high] over features [+high], we observe in the above tableau, that candidate (a) violates the undominated constraint PARSE(−high) and thus gets eliminated. Candidates (b) and (c) have almost identical violations in the table except that candidate (b) fails to preserve, in line with the established [−F] » [+F], the [−F] feature, i.e. the feature [-back] of the input vowel [i] and thus again gets eliminated. We observe

Again, as with the other examples discussed above, the same asymmetry rules, the same ranking hierarchy applies i.e. deletion is motivated by a higher ranking of feature [−high] over features [+high], we observe in the above tableau, that candidate (a) violates the high ranked constraint PARSE[−high] and thus gets eliminated. Candidates (b) and (c) have almost identical violations in the table except that candidate (b) fails to preserve, in line with the established PARSE[−F] » PARSE[+F], the [−F] feature, i.e. the feature [-back] of the input vowel [i] and thus again gets eliminated.

Casali (1996, 1997) deals with this kind of asymmetric coalescence evidenced here in Ndebele and discussed above, specifically positing that it arises when both feature-sensitive and position-sensitive constraints are active in the evaluation of output candidates; that is, the feature specification [-high] must be preserved in preference to [+high], otherwise all features of the V_2 are to be preserved (c.f. Casali, 1996 and Tanner, 2007).

6. Vowel elision/deletion as hiatus resolution strategy in (isi) Ndebele

Elision of V_1 is also a major hiatus resolution mechanism in many languages. While in other languages the choice of whether V_1 or V_2 occurs is subject to differences in morphological boundaries at which the vowels sequences occur as well as language internal morphosyntactic concatenations, in Ndebele there seems to be only instances of V_1 elision. In languages in which there is a choice of which vowel to elide it is largely depended on the featural qualities of the combination of vowels that would be straddling a word boundary.

While there is, in many languages, evidence to attest for the occurrence of both elisions of the first and of the second vowels in the sequences, there seems to be, in Ndebele, a higher occurrence of V_1 elision. This mostly happens when the vowel supplying V_1 is a low vowel, in most instances, the low vowel/a/when it precedes a mid vowel. As such, the low vowel/a/only deletes in the face of the vowels/e/and/o/whose features are [−high, −low]. Such kind of deletion rule is schematized as in (25) below.

([−high, −low]) conflict and there is no compromise vowel in between as in the case of the contexts in which the [−high, +low] vowel/a/is juxtaposed with [+high, −low] high vowels/i/and/u/ where the compromise is a mid vowels/o/and/e/.

An example at which such a rule applies in Ndebele is with tense markers. At the boundary involving the present continuous tense prefixes/ngiya-/'I do' and/uya-/'s/he does', as well as the recent past/past tense prefixes/nga-/'I did' and/wa-/'s/he did' and a vowel verb (a verb whose stem begins in a mid vowel), elision of the first vowel in the sequence, the [+low]/a/occurs in preservation of the mid vowels. Sibanda (2009) explains that this kind of deletion occurs mainly when there is incompatibility of the features in a sequence of two or more vowels.

Tenses in Ndebele are quite regularly formed and where the final vowel of the tense marker is juxtaposed with the initial vowel of the mid vowel commencing verb, the general rule that applies is that the vowel which immediately precedes the verb stem is elided. Consider the following examples in (26) below.

(26)

a) ngi- ya- enz- a [ngiyenza] /a_1#e_2/→ [e_2] 'I do'
1s-Pres Cont- do- FV

b) u- ya- enz- a [uyenza] /a_1#e_2/→ [e_2] 'S/he does'
2s- Pres Cont- do- FV

c) ka- ngi- enz- i [kangenzi] /a_1#e_2/→ [e_2] 'I am not doing'
neg- 1s/Pres Cont- do- FV

d) k- a- enz- i [kenzi] /a_1#e_2/→ [e_2] 'S/he is not doing'
neg- 2s/Pres Cont- do- FV

(25) *Vowel Deletion Rule in (isi)Ndebele*

V V

[+low]→ø /___ [-high, -low]

The rule illustrates that a [+low] vowel is deleted before a mid [-high, -low] one.

We note that deletion in (isi)Ndebele largely happens, save in exceptional cases such as discussed in 9, when the low vowel is juxtaposed with mid vowel. In contexts in which the same [+low] vowel is juxtaposed with the high vowels/u/and/i/with the features [+high, −low] as well as a similar low vowel/a/with the features [−high, +low], coalescence takes place. This happens because the [−high, +low] features of/a/and those of the mid vowels

We note that in Ndebele, like coalescence and glide formation, elision does not result in a surface long vowel. This again is in violation of place maintenance constraints. Again if we were to argue that deletion is syllable structure conditioned and primarily motivated to eliminate onsetless syllables, elision of this kind is in violation of the faithfulness constraints MAX-V and MAX-IO. We illustrate this as in Tableau 11 below.

/k**a**-**e**nzi/	ONSET	MAX-V	MAX-IO
(a) ☞/ke.nzi/		*	*
(b) /ka.e.nzi/	*!		

Tableau 11: Vowel deletion with no compensatory lengthening in (isi)Ndebele

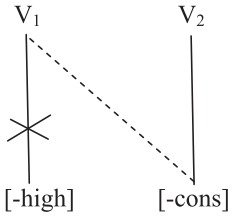
Observe that the faithful candidate (b) violates ONSET and thus gets eliminated. The optimal candidate, despite a violation of MAX-V and MAX, because it deletes an input segment and also fails to preserves the V-slots of the input in the output, eliminates the vowel sequence, thus wins. At the surface we thus can argue for the existence in Ndebele of a ranking system that would rather delete a segment than preserve an ONSET violating sequence, an ONSET»-MAX ranking.

Sibanda (2009) also provides the following examples to illustrate the form of elision discussed as well as exemplified above.

(27) *Deletion of the low vowel/a/when followed by a mid vowel in Ndebele*

a)	a- enza 6s- do	[enza]	'they are doing'
b)	a-ona 2s- spoil	[ona]	'they are spoiling'
c)	be-sa-enza 2s-Prog Pref-do	[besenza]	'while they are still doing'
d)	be-sa-ona 2s-Prog Pref-spoil	[besona]	'while they are still spoiling'
e)	ba-onke 2s-all	[bonke]	'all'
f)	ba-odwa 2s- alone/only	[bodwa]	'only them, alone'

(28)



Vowel Deletion in (isi)Ndebele (Sabao, 2009, 2013)

Elision of this kind, can also, within the explications of OT be explained through an analysis of the distribution of prevocalic vowels. In this regard non-high ([−high]) prevocalic vowels occurring in V_1 in a sequence delete. Such a process as in (27) can be schematized as follows;

Elision in Ndebele is thus explainable through the ranking system that subordinates the [−F'] constraints below the [+F] ones, in this case the ranking of IDENT[+F] below IDENT[−F]. We observe in line with such an observation, Tableau 12.

/b**a**-**o**dwa/	ONSET	IDENT [-high]	IDENT [-low]	IDENT [+high]	IDENT [+low]	PARSE[F']	UNIFORMITY
(a) /ba.o.dwa/	*!						
(b)☞/bo.dwa/					*	*	**
(c) /ba.dwa/		*!				*	**

Tableau 12: ONSET driven and feature sensitive vowel elision in (isi)Ndebele

We observe in line with the thesis I have established above, i.e. the IDENT[−F]»IDENT[+F] that candidate (c) violates a constraint IDENT[-high] thus gets eliminated. On the other hand, candidate (b) despite a violation of an IDENT[+low] constraint is selected to be the optimal candidate. This is so because the constraint it violates, the IDENT[+low] constraint which accordingly is ranked below the IDENT[low] constraint that it satisfies is ranked low in the language. Both the two candidates (a) and (c) also violate PARSE[F'] constraint though. Candidate (a) for the obvious violation of ONSET through heterosyllabification of vowels also gets eliminated.

Interesting however to note is example (26c) which seems to be an exception to the rule that elides low vowels in the face of mid vowels because the V_1, which also suffers from the V_1 elision rule is not a low vowel but a high vowel/i/with the features [+high, −low]. Consider the Tableau 13 regards such an observation.

/kang**i-e**nzi/	ONSET	IDENT [-high]	IDENT [+high]	IDENT [-low]	IDENT [+low]	PARSE[F']	UNIFORMITY
(a) ka.ngi.e.nzi/	*!						
(b)☞/ka.nge.nzi/			*			*	**
(c) /ka.ngi.nzi/		*!				*	**

Tableau 13: ONSET driven and feature sensitive vowel elision in (isi)Ndebele

I observe here again that still, the same constraint ranking applies. We note that despite the fact that the vowel supplying V_1 is a high vowel, the optimal candidate still emerges the one which in the process of vowel sequence elimination through deletion does not violate an IDENT[−F]. Violations of IDENT[+F] are tolerated in the language. In line with this we observe that candidate (c) gets eliminated because of a violation of the feature [−high] of the input vowel/e/. On the other hand, candidate (b), the optimal candidate despite a violation of the [+high] feature of the input vowel/i/ emerges as the optimal candidate. This is so because it does not violate ant [-−F] constraints. Candidate (a) for a violation of ONSET gets eliminated too.

As earlier on footnoted, personal communication has directed me to a different analysis of the example analysed in the tableau above. The resolution of the vowel sequence should ordinarily be through glide epenthesis and not elision. This is so because the features of the vowels at the morphological boundary point towards conditions that favour that kind of repair strategy. In this regard the resolution of hiatus here should be achieved as follows;

(29)

ka- ngi- enz- i [kangiyenzi] $/a_1\#e_2/\rightarrow [j_1e_2]$ 'I am not doing'
neg- 1s- do- FV

The resolution through elision, while seeming to be in line with the IDENT[−F']»IDENT[+F'] constraint ranking hierarchy used for the analysis of elision data as highlighted above is a result of extralinguistic constraints governing language use and speech patterns. This however is not a conclusive argument and warrants further independent research. Elision in Ndebele therefore can be argued to be motivated by both the need to eliminate vowel sequences as well as ONSET driven. As such, it occurs through a ranking system that aims at preserving the [−F'] features over the [+F'] features. This ranking hierarchy also successfully predicts the selection of optimal candidates in coalescence in the language as we also not that coalescence occurs in cases where there is a vowel sequence/a/with the features [−high, +low] and either of the high vowels/i/or/u/both with the features [+high, −low]. We observe that the resultant vowels from the mergers of the vowels are the mid vowels/e/and/o/, both with the features [−high, −low] which preserve the [−F] above the [+F] by failing to parse the [+low] and [+high] features of the input low and high vowels respectively. Thus in the process justify the constraint ranking hierarchy of IDENT[−F']»IDENT[+F'].

7. Conclusion

Observing instances in which hiatal configurations are resolved in (isi)Ndebele, it can be concluded that as a resolution strategy, coalescence involving dissimilar vowels in (isi)Ndebele is largely asymmetric coalescence, i.e. the resultant surface vowel is determined by the serial ordering of the vowels at the boundary as well as the feature specifications of the vowels in the VV sequence. It is also observed that in instances where coalescence takes place with dissimilar vowels the sequence of vowels would be that of a low vowel and a high vowel and the resultant vowel being a non-high vowel (i.e) a mid vowel. Such coalescence which takes place in Ndebele also follows in line with the feature ranking system [−F] » [+F] established in the discussion. This is so because the resultant mid vowel neutralizes the [+F.] ([+] features) of both vowels, i.e. the [+low] of the low vowels and the [+high] of the high vowels resulting in a vowel that contains the features specifications [−high] and [−low]. On the other hand elision in (isi)Ndebele is height conditioned i.e. primarily motivated by the need to preserve the [−F]. This is so because we can observe that in Ndebele there is deletion of low vowels if juxtaposed with non-low vowels containing the features [−high, −low]). Elision in Ndebele is thus explainable through the ranking system that subordinates the [−F.] constraints below the [+F] ones, in this case the ranking of IDENT [+F] below IDENT[−F]. Glide formation/epenthesis occurs mostly in instances where the first vowel in the sequence is a high vowel. To undergo gliding, the high vowel must as a matter of necessity

also contain either of the feature specifications [+back] and/or [+round] which are the features of the resultant glide/w/. The demand by the languages that the vowel contains these features is in line with the need to maintain segmental identity as well as articulatory identity between the input and the output. Glide formation in (isi)Ndebele is also feature sensitive. There is an apparent attempt at the maintenance of the featural specifications of all the input material/segments. This is so in line with the observation that the resultant glide is always identical in feature specifications with the V_1, (which is the vowel that glides) i.e. the high back vowel/u/in all instances of glide formation glides into a/w/.

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